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Let $y^2=m^2x$ be the equation of the curve. In this case we have,

$$\bar{x}=\frac{\int_0^a\int_0^{mx^{\frac{1}{2}}}(a-x)xdxdy}{\int_0^a\int_0^{mx^{\frac{1}{2}}}(a-x)dxdy}=\frac{\int_0^a(a-x)x^{\frac{3}{2}}\,dx}{\int_0^a(a-x)x^{\frac{1}{2}}\,dx}=\left[\frac{\frac{2}{5}ax^{\frac{5}{2}}-\frac{2}{7}x^{\frac{7}{2}}}{\frac{2}{3}ax^{\frac{3}{2}}-\frac{2}{5}ax^{\frac{3}{2}}}\right]_0^a=\tfrac{3}{7}a.$$

Therefore, the center of pressure is $\frac{3}{7}a$ below the surface.

(2). To find the center of pressure on the outer figure. We have

$$\bar{x}=\frac{\int_0^a\int_0^{b-mx^{\frac{1}{2}}}(a-x)xdxdy}{\int_0^a\int_0^{b-mx^{\frac{1}{2}}}(a-x)dxdy}=\frac{\int_0^a(a-x)(b-mx^{\frac{1}{2}})xdx}{\int_0^a(a-x)(b-mx^{\frac{1}{2}})dx}$$

$$=\left[\frac{\frac{1}{2}abx^2-\frac{2}{5}amx^{\frac{5}{2}}-\frac{1}{3}bx^3+\frac{2}{7}mx^{\frac{7}{2}}}{abx-\frac{2}{3}amx^{\frac{3}{2}}-\frac{1}{2}bx^2+\frac{2}{5}mx^{\frac{5}{2}}}\right]_0^a.$$

But the curve gives $b^2=m^2a$ or $m=b/a^{\frac{1}{2}}$. Substituting this value of $m$, and reducing, we have, $\bar{x}=\frac{11}{49}a$. Hence the depth of the center of pressure$=\frac{38}{49}a$.

Also solved by *G. B. M. ZERR*, and *T. T. DAVIS*.

## DIOPHANTINE ANALYSIS.

89. Proposed by J. H. DRUMMOND. LL. D., Portland, Me.

Show that in $2x^2+2y^2-z^2=\square$....(1),
$2x^2+2z^2-y^2=\square$....(2),
$2y^2+2z^2-x^2=\square$....(3),
any two numbers and their sum and difference will satisfy the conditions.

Solution by G. B. M. ZERR, A. M., Ph. D., Professor of Chemistry and Physics in The Temple College, Philadelphia. Pa.

Let $2x^2+2y^2-z^2=a^2$, $2x^2+2z^2-y^2=b^2$, $2y^2+2z^2-x^2=c^2$.

Adding, $2x^2+2y^2+2z^2=\frac{2}{3}(a^2+b^2+c^2)$.

$\therefore z=\pm\frac{1}{3}\sqrt{(2b^2+2c^2-a^2)}$,

$y=\pm\frac{1}{3}\sqrt{(2a^2+2c^2-b^2)}$,

$x=\pm\frac{1}{3}\sqrt{(2a^2+2b^2-c^2)}$.

Let $b=(n+1)a$, $c=na$.

$\therefore z=\pm\frac{a}{3}(2n+1)$, $y=\pm\frac{a}{3}(n-1)$, $x=\pm\frac{a}{3}(n+2)$.

Solutions of problem 87 were received from *H. S. VANDIVER*, *G. B. M. ZERR*, *J. H. DRUMMOND*, and *H. C. WHITAKER*; of problem 88. from *G. B. M. ZERR*, *J. H. DRUMMOND*, *J. SCHEFFER*, and *H. C. WHITAKER*.